clock rate and for "following" in the case of photographing the spectrum of a comet.

In order to obtain a serviceable width and the necessary density to the spectra, a rate of acceleration or retardation is given to the driving clock. This rate depends on the magnitude of the star in question, its type of spectrum, and its declination. The adjustment for rate is accomplished by regulating the speed of the governor ring by means of the cam mentioned above, the indicator being set to readings which have been derived from previous photographs.

The McClean telescope is mounted on three concrete pillars in a building with a circular concrete-block wall, internal diameter of 18 ft., on which is a hemispherical dome made of wood and covered with rubberoid. The wall is double—that is, has an air space in order to prevent rapid changes of temperature of the air in the dome. The dome rests on iron wheels running on a circular rail fixed to the upper part of the wall, and is easily revolved by hand by means of an endless rope round a grooved pulley fixed to the axis of one of the wheels. The shutters, also operated by hand, are made in two sections and run on rails at their upper and lower extremities; when open, a clear view of the zenith is obtained.

All the electric connections for the telescope and lighting purposes and for the driving-clock wire are led in a trough into an annexe in which are placed the electric pendulum, small accumulators, dark room, etc.

The building is situated on the top of Salcombe Hill to the east of Sidmouth; it is 580 ft. above sea-level, and commands an uninterrupted view of the horizon in every direction.

Since the instrument was first brought into use in September, 1913, the site has been found to have all the excellent observing conditions that were anticipated.

Smoke, mist, artificial-light glare are conspicuous by their absence, and on only one occasion has high wind in a clear sky prevented observation. The hill-top is often clear when the adjacent valley is filled with mist or cloud. Cloud on the top is rare.

The purity of the sky on almost all occasions when free from clouds is extremely advantageous for photographic observations. At South Kensington such clear, dark skies were extremely rare, and then only one or two hours in the early morning were at all comparable with the conditions here. The excellence of the atmospheric conditions is well shown by the extension of the spectra into the ultra-violet. A spectrogram of α Cygni taken with the 9-in. Henry prismatic camera shows the hydrogen series down to H_ω (λ 3667·8), *i.e.* twenty-three hydrogen lines on the one plate. The most refrangible hydrogen line recorded in the South Kensington reduction of the spectrum of α Cygni was H_θ (λ 3798). It may also be mentioned that the southern stars α Columbæ (dec. $-34^\circ\ 8'$) and λ Scorpionis (dec. $-37^\circ\ 2'$) have been seen with the naked eye. The steadiness of the image is normally greater than at South Kensington, and long exposures on faint stars give spectra showing definition of a very satisfactory character.

The working list prepared for use with the 12-in. McClean instrument contains all the stars of the Harvard revised photometry of magnitudes fainter than 4·0 and brighter than 5·0 to the north of dec. -15° which were not included in the catalogue of 470 brighter stars compiled at South Kensington. For these stars exposures of twenty minutes to one hour, according to magnitude and type, are usually amply sufficient to yield spectrograms of sufficient width and density to exhibit enough detail for the purpose of classification. Neighbouring stars fainter even than 6·0 magnitude are sometimes satisfactorily recorded.

A catalogue of the stars the spectra of which have been photographed and classified since 1913 at the Hill Observatory has been prepared; it contains 354 stars. The designations, positions for 1900, magnitudes, and Harvard classification have been taken from the Revised Harvard Catalogue (Annals of the Astronomical Observatory of Harvard College, vol. iv.). In the last column of the table is given the equivalent Kensington classification. The small letters *h, c*, and *a* indicate whether the star is increasing its temperature (hotting) (*h*), decreasing its temperature (cooling) (*c*), or at the apex (*a*) of the temperature curve or about the condition of being most hot. The letter (*p*) denotes that there is some peculiarity about the spectrum.

These small letters will save references to the groups in my classification in the case of those inquirers chiefly interested in temperatures. They also show that the Harvard classification includes both classes of stars under the same designation in the other cases.

Before the war Lieut. Lockyer, R.N.V.R., and Mr. Johnson and Mr. Goodson were the assistants engaged in photographing and classifying the spectra. Since Lieut. Lockyer and Mr. Johnson took up their military duties, their work has been carried on by Mr. Goodson.

NORMAN LOCKYER.

THE ATTACKS OF BIRDS UPON FRUIT.

UNDER the heading of "The Ravages of Birds" a correspondence has arisen in the *Times* which is apt to mislead both the general public and fruit-growers on a subject already overburdened with misrepresentation and error.

It is suggested by one correspondent that there are two simple methods for preventing the attacks of birds upon fruit, viz., (i) provision of drinking water, (ii) provision of food to entice the birds away from the fruit. That there may be a scarcity of water in some districts is quite possible, but at the time when the missel thrush, blackbird, blackcap, bullfinch, etc., attack fruit there is an abundance of animal food in the form of insect larvæ, insects, worms, slugs, snails, etc., in addition to wild fruits and seeds. Further, if a few of these fruit-eating birds are shot, and the

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stomach contents examined, it is surprising how little fruit-pulp is found. Again, if blackbirds are kept in confinement and fed on similar ripe fruit very little is consumed.

Careful observation and experiment have shown that in most cases where ripe fruit is attacked it is not due to a scarcity of food, and that very much more fruit is damaged than eaten. In different parts of the United States it has been found that the provision in orchards of water has considerably lessened the damage by birds to the fruit.

Mr. G. F. Burgess, another correspondent, asks, "If the birds need water, why provide food? If it is food they want, why provide water? It is quite possible," he continues, "that the birds acquired the 'fruit habit' in times of drought, but the habit is now so well established that the damage goes on in wet and dry seasons alike." This brings us much nearer the actual truth. A supply of water may keep young birds away from the fruit in times of drought, but once a bird acquires the fruit-eating habit, experience shows that nothing will change it.

This change of habit in the nature of the food opens a big question, and one around which much controversial matter ranges, but where cases have been subjected to careful investigation by competent workers one striking fact has been brought out, viz., that the particular species of bird or birds had been allowed to increase unduly, and is now too plentiful. This has been proved in the case of the cereal-feeding habit of the rook,[1] and the fruit-eating habit of the blackbird and missel thrush.

It seems surprising that, in a country where the question of producing the maximum amount of home-grown food is one of vital importance, so many economic problems related thereto have been almost entirely neglected. We are offering protection to certain injurious wild birds and permitting other beneficial species to be wantonly destroyed, with the result that food to the value of tens of thousands of pounds sterling is annually destroyed. That the same thing is taking place in connection with our fisheries there is good reason to believe.

In other countries the State has made provision for systematic and continued investigation on the subject, much to its material benefit, but as a writer has recently very pertinently stated, "In the matter of economic ornithology we in England are disgracefully behind the times; the Board of Agriculture seemingly prefers to leave this matter to private enterprise, or to deal with the matter in such a perfunctory manner as to be positively ridiculous, making us the laughing-stock of the nations."[2] In the past the want of financial means has been the excuse, but the present apathy can scarcely be due to that cause, seeing the manner in which huge sums are being used out of the Development Grant for far less important purposes.

WALTER E. COLLINGE.

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[1] "The Food of Some British Wild Birds." (London, 1913.)

[2] *Ann. and Mag. Nat. Hist.*, 1908 (s. 8), vol. ii., p. 132.

NOTES.

AMONG those who were on board the *Royal Edward* when she was torpedoed and sunk in the Ægean Sea was Capt. Charles Bertram Marshall. When last seen he was standing on the deck giving orders to his men to keep cool; and he seems to have died as he had lived, a brave, generous, and unselfish man. Although Capt. Marshall had no intention of devoting himself to purely scientific pursuits, he belonged to that too rare class of medical men who, before embarking upon the practice of their profession, endeavour to obtain a thorough all-round training in the ancillary sciences and experience in original research. In addition to the customary series of hospital appointments, Dr. Marshall held a demonstratorship in anatomy in Manchester University, and carried out a successful investigation in reference to the movements of the stomach and the chemistry of the digestive processes, for which he received the M.D. degree with commendation. He was a man of exceptional ability and charm of character, and he gave promise of accomplishing much in the advancement of the science of medicine.

WE regret to see the announcement that Lieut. J. A. Dixon was killed at the Dardanelles on August 9. After a first season's work in Nubia, he took part in the expeditions sent to Abydos in Upper Egypt by the Egypt Exploration Fund in the winters 1909–10 and 1910–11, in the capacity of draughtsman and assistant excavator. The illustrations of the volumes dealing with those expeditions are a sufficient testimony to the amount and quality of his work. His ambition, however, was to make a name for himself in the field of copying in water colours the scenes which adorn the rock tombs of Thebes, and his first efforts in this direction had met with considerable success. In the desert camp, where the qualities of a man are tried to the utmost, he was a keen worker and a bright and frank companion, generous to the last degree. He loved Egypt and everything in it, from the luxury of a Cairo hotel to the discomfort of the excavator's camp. His treatment of natives was ideal: sympathetic, just and friendly, and yet with that background of firmness which too many Europeans lack, but which is, in truth, the only passport to the respect and admiration of the Arab. Since 1912 he had been connected with the expeditions of Mr. Wellcome in the Sudan, but there is little doubt that his heart was in Egypt proper, and that, had he lived, he would have contrived to return to his painting among the Theban tombs.

MR. CLAUDE GRAHAME-WHITE and Mr. Harry Harper contribute to the *Fortnightly Review* for September an interesting account of "Zeppelin Airships: their Record in the War." It is refreshing to find an article on aircraft, especially Zeppelin airships, which is not full of that nonsense which the present conflict has inspired in overflowing measure. A highly-complex technical problem such as the airship presents is not readily made clear to the lay mind, and the authors of this article give only slight space to a discussion of technical questions of construction,

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